

Atmospheric Dynamics Near Jupiter's Great Red Spot: First Results from Galileo Imaging

A. R. Vasavada, A. P. Ingersoll (Caltech), J. Spitale (Caltech/LPL)

Images of Jupiter's Great Red Spot (GRS) and immediate surroundings from the Galileo Orbiter have a combination of spatial, spectral, and temporal resolutions that is yielding numerous new insights into the dynamics of Jupiter's atmosphere. These data directly address poorly understood concepts such as the stability of Jupiter's winds, their energy budget, and their vertical structure. The SSI instrument probed Jupiter at spatial scales of 30 km/pixel in one visible and three near infrared wavelengths at timescales of one to eleven hours. At this spatial resolution, the one-hour time sequence allows the retrieval of the GRS wind field by tracking cloud features as they are advected in the flow. The ten-hour time sequence reveals motions within the quiescent center of the GRS and other turbulent and convectively active regions surrounding the GRS. We compare our derived wind fields with similar Voyager results. Images of interesting regions surrounding the GRS are studied in greater detail. A region of cloud streaks and clusters northeast of the GRS exhibits great temporal variability and may be the first convective processes observed in Jupiter's atmosphere at that scale. We also are attempting to quantify the properties of a mesoscale wave similar to those observed by Voyager. The unprecedented near infrared spectral coverage of the SSI provides the first-ever vertical structure information at horizontal scales comparable to an atmospheric pressure scale height. We hope to use this vertical information, and possibly the lower resolution NIMS and PPR results, to distinguish horizontal atmospheric motions at different heights in Jupiter's atmosphere.

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Paper presented by Ashwin R. Vasavada

170-25

Caltech

Pasadena CA 91125 USA

Phone: 818-395-6960

Fax: 818-585-1917

Email: ashwin@ptolemy.gps.caltech.edu

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